

Case Study

Effect of Thoracic Stretching, Thoracic Extension Exercise and Exercises for Cervical and Scapular Posture on Thoracic Kyphosis Angle and Upper Thoracic Pain

WON-GYU YOO¹⁾

¹⁾ Department of Physical Therapy, College of Biomedical Science and Engineering, Inje University and Elderly Life Redesign Institute: 607 Obangdong, Gimhae, Gyeongsangnam-do 621-749, Republic of Korea

Abstract. [Purpose] The purpose of this study was to investigate the effect of thoracic stretching, a thoracic extension exercise and exercises for cervical and scapular posture on thoracic kyphosis angle and upper thoracic pain. [Subject] A 36-year-old male, who complained of upper thoracic pain at the T1–4 level with forward head and round shoulders, was the subject. [Methods] He performed thoracic stretching (session 1), a thoracic extension exercise (session 2), and muscle exercises for cervical and scapular posture (session 3). [Results] The upper thoracic pressure pain threshold increased after session 1, session 2, and session 3. The thoracic kyphosis angle decreased after session 1, session 2, and session 3. [Conclusion] We suggest that intervention for thoracic pain or kyphotic thoracic correction should use not only an approach for extending the thoracic muscles, but also an approach treating muscles in the cervical and scapular region.

Key words: Kyphosis, Posture correction, Thoracic pain

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INTRODUCTION

Upper thoracic pains are produced by tearing of connective tissues around the upper thoracic joints or upper thoracic muscle spasms^{1, 2)}. Upper thoracic pain commonly occurs in repetitive or prolonged bending, twisting or sitting activities, such as computer work or industrial work involving combinations of these activities^{3, 4)}. Sometimes, patients experience sudden upper thoracic pain during a movement such as picking up a pencil⁴⁾. A study suggested that increased thoracic kyphosis may be associated with higher spinal loads and abnormal trunk muscle force in an upright stance¹⁾. Thoracic kyphosis might also accelerate degenerative processes and contribute to thoracic dysfunction and thoracic pain²⁾. Clinicians suggest that a stretching and strengthening rehabilitation program for thoracic pain reduces symptoms and pain, and improves function²⁾. The purpose of this study was to investigate the effect of thoracic stretching, a thoracic extension exercise, and exercises for cervical and scapular posture on thoracic kyphosis angle

and upper thoracic pain.

SUBJECTS AND METHODS

The study subject was a 36-year-old male, who complained of upper thoracic pain at the T1–4 level, and had a forward head posture and rounded shoulders. Ethical approval was granted by Yonsei University Faculty of Health Science Human Ethics Committee, and the subject provided written informed consent before participating in the study. He had complained of continuous upper thoracic pain for 3 months, but had not undergone any specific treatment for this condition. The pain consisted of mechanical upper thoracic pain without radiating pain. When he performed thoracic forward flexion in the standing position with his knees fully extended, he experienced pain and stiffness at the T1–4 level. A dolorimeter (Fabrication Enterprises, White Plains, NY, USA) was used to measure the pressure pain threshold of the upper thoracic region. Before making measurements with the pressure dolorimeter, we instructed our subject to say ‘ah!’ when he began to feel pain. Then, we applied pressure with the dolorimeter to the right side of the body to measure the pressure pain. The reliability of pressure pain threshold measurements is greater than 0.8. The initial pressure pain threshold was 3.5 lb. A dual inclinometer (ACUMAR, Lafayette Instrument, Lafayette, USA) was used to measure the thoracic kyphosis angle. The feet of the inclinometer were placed over the processes of the first

Corresponding author: Won-gyu Yoo (e-mail: won7y@inje.ac.kr)

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and second thoracic vertebrae and over the twelfth thoracic and first lumbar vertebrae. These spinal levels were determined by palpation. Measurements were made in a relaxed standing position with the subject adopting a natural posture. The initial thoracic kyphosis angle was 47°. Then, the subject performed thoracic stretching (session 1), a thoracic extension exercise (session 2), and muscle exercises for cervical and scapular posture (session 3). The three sessions each lasted 10 days, and we measured the upper thoracic pressure pain threshold and thoracic kyphosis angle after each session.

Session 1: The subject performed a stretching exercise, using a roller to hinge the upper back backwards over the roller in the supine position. The subject was instructed that he would feel stretching or tightness in the mid-back, should take care not to overextend the neck. For 10 days, he performed five sets of 30 repetitions of the stretching exercise daily. Session 2: The subject performed thoracic extension exercises. While sitting on a chair, he clasped both arms behind his head, gently arching backwards and looking up. For 10 days, he performed five sets of 30 repetitions of the thoracic extension exercises daily. Session 3: The subject performed individual strengthening exercises for the muscles associated with the cervical spine and scapula position. The first exercise was a neck retraction exercise using a Thera-Band®. He placed the middle of the band around the back of his head and grasped the ends of the band in front of his head. Keeping his neck in a neutral position with the chin slightly tucked, he extended his elbows, stretching the band forward, while keeping his neck stable. The second exercise was a scapula retraction exercise. The band was put around a solid object at about waist level. Holding one end of the Thera-Band in each hand, with his elbows at his sides bent to 90 degrees, he pulled the band backwards to move his shoulder blades toward each other. He performed both exercises for 10 days, with five sets of 30 repetitions of each per day.

RESULTS

The upper thoracic pressure pain threshold increased after session 1 (3.8 lb), session 2 (4.5 lb), and session 3 (6.0 lb), compared to the initial threshold of 3.5 lb. The thoracic kyphosis angle decreased after session 1 (46 degrees), session 2 (44 degrees), session 3 (40 degrees), compared to the initial angle of 47 degrees.

DISCUSSION

Recently, treatments for thoracic pain have focused on reducing the thoracic kyphosis angle. For this, upper trunk muscle activation might have positive effects on vertebral loading, trunk control, and balance⁵⁾. Our results show that muscle strengthening exercises, *i.e.*, sessions 2 and 3, were more effective for upper thoracic pain than simple stretching exercises, *i.e.*, session 1. Increased thoracic kyphosis posture is commonly accompanied by a forward head posture or rounded shoulders^{5, 6)}. Therefore, we added session 3, consisting of neck and scapula retraction exercises, to the standard treatment – thoracic stretching (session 1) and thoracic extension exercises (session 2). We observed the greatest changes in thoracic pain and kyphosis angle after session 3. We believe that intervention for thoracic pain or kyphotic thoracic correction should include not only treatments for the muscles used in thoracic extension, but also treatment for the cervical and scapular muscles. This study was limited in that it involved only a single participant. For generalization, further studies should examine many patients.

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